Bonneville Power AdministrationPower Administration
Fish and Wildlife Program FY98 Proposal Form

Section 1. General administrative information

Title Evaluate Meadow Creek Instream Structure and Riparian Restoration.

Bonneville project number, if an ongoing project 8018

Business name of agency, institution or organization requesting funding
USFS, Wallowa-Whitman National Forest, La Grande Ranger District

Business acronym (if appropriate) USFS

Proposal contact person or principal investigator:

Name	Paul L. Boehne
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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
PNW Research Station	3200 Jefferson Way	Corvallis OR, 97331	Dr. James Sedell
Department of Fish & Wildlife, OSU	104 Nash Hall	Corvallis OR, 97331	Dr. J. Boone Kauffman
Department of Forest Engineering, OSU	Peavy Hall	Corvallis OR, 97331	Dr. R.L. Beschta

NPPC Program Measure Number(s) which this project addresses.

Measure 205 - Coordinated Implementation, Monitoring and Evaluation

NMFS Biological Opinion Number(s) which this project addresses.

LRMP Biological Opinion for Snake River Basin ESU Summer Steelhead

LRMP Biological Opinion for Snake River Basin ESU Spring/Summer Chinook Salmon

Starkey Range Allotment Biological Opinion

Other planning document references.

NMFS Proposed Recovery Plan for Snake River Salmon - Ecological Goal 10- Chapter V-1-16.

NMFS Proposed Recovery Plan for Snake River Salmon- Tasks to Begin Recovery- Chapter V-1-45.

Upper Grande Ronde River Anadromous Fish Habitat Protection, Restoration and Monitoring Plan- Survey/Inventory/Monitoring page 17 & 18.

Grande Ronde Model Watershed Program- Operations Action Plan- Appendix B-4.

Upper Grande Ronde River Basin Watershed Analysis-USFS

Subbasin.

Grande Ronde River

Short description.

Continue the life history work on summer steelhead smolt outmigrant trapping, juvenile rearing and habitat capability, and determination of winter habitat capability. Riparian work includes assessment of cattle and big game influences on recovery rates on species, and biomass, and on channel structure and habitat diversity. Both passive and active restoration efforts are evaluated.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction	X	Watershed
	Resident fish		O & M		Biodiversity/genetics
	Wildlife		Production	+	Population dynamics
	Oceans/estuaries	X	Research	+	Ecosystems
	Climate	+	Monitoring/eval.		Flow/survival
	Other		Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

Sampling, life history, riparian vegetation, recovery, restoration

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
		This project continues the monitoring of life history strategies and riparian vegetation recovery

Section 4. Objectives, tasks and schedules

Briefly describe measurable objectives and the tasks needed to complete each objective. Use Column 1 to assign numbers to objectives (for reference in the next table), and Column 3 to assign letters to tasks. Use Columns 2 and 4 for the descriptive text. Objectives do not need to be listed in any particular order, and need only be listed once, even if there are multiple tasks for a single objective. List only one task per row; if you need more rows, press Alt-Insert from within this table.

The overall project goal is to determine effectiveness of instream and riparian restoration measures on improving salmonid life history strategies thereby contributing to the Northwest Power Planning Council's goal of improving anadromous fish runs in the Columbia River Basin.

Hypothesis and Assumptions

Hypotheses:
1) Riparian/stream ecosystems and the salmonids that depend upon them can be successfully restored through a combination of passive and active restoration approaches;

2)Riparian area restoration in an Intermountain stream system will improve water quality, channel morphology, and instream productivity over time, thereby leading to an increase in the systems' capability to produce salmonid smolts;

3)The removal of livestock grazing from Meadow Creek reaches (e.g. passive restoration) will initiate the recovery of both riparian hardwood communities and meadow communities. Principal responses of this passive restoration technique included increased density and reproduction in the shrub dominated communities, changes in water quality, and increased root biomass, water infiltration rates, and bank structure/channel complexity; and

4)Active restoration approaches in concert with passive restoration can influence salmonid productivity through the re-connection of linkages between the water column and floodplain. This includes lowered stream temperatures, enhanced riparian vegetation

structure and diversity, and a biogeochemistry that reflects the riparian influences on the aquatic system.

Assumptions:
1) The main assumption is that smolt production can be measured accurately with smolt traps. The estimation techniques used are limited by the sample size. Meadow Creek is underseeded but the estimation of all life history stages and the linkages with habitat variables should allow for habitat utilization.

2) In addition, we assume that restoration activities will result in measurable improvements of habitat features and ultimately, increases in steelhead numbers. Short term habitat features to be measured include the vegetation, soil, water, and stream channel responses.

Obj 1,2, 3	**Objective**	**Task a,b,c**	**Task**
1	Quantify factors limiting the production of anadromous salmonids in Meadow Creek	a	Habitat survey and mapping
		b	Redd surveys
		c	Stream temperature monitoring
		d	Smolt sampling
		e	Stream flow monitoring
2	Based on limiting factor analysis, identify restoration techniques that will increase production of anadromous salmonids in Meadow Creek		
3	Quantify and analyze data on habitat characteristics, fish populations and assemblages, and salmonid smolt production to evaluate life history strategies of summer steelhead	a	Spring smolt trapping
		b	Summer habitat/fish sampling
		c	Habitat mapping
		d	Stream flow monitoring
4	Quantify channel response to passive and active restoration	a	Channel transects
		b	Stream flow monitoring
		c	Habitat surveys and mapping
5	Quantify the nutrient, physical,	a	Stream water chemistry

	and biotic linkages between riparian and aquatic zones that influence the habitat quality of salmonids in Meadow Creek		monitoring
		b	Channel transects
		c	Habitat surveys and mapping
6	Determine the differences in the ecosystem processes that link floodplain and aquatic environment between intact and degraded riparian zones. This includes quantification in forested reaches, meadow reaches and shrub reaches of Meadow Creek.	a	Habitat survey and mapping
		b	Stream temperature monitoring
		c	Stream flow monitoring
		d	Stream water chemistry monitoring
		e	Riparian vegetation surveys/transects
7	Quantify growth and reproductive response of riparian hardwoods to appropriate passive and active restoration approaches.	a	Riparian vegetation surveys/transects
		b	Plant growth and biomass measurements
8	Quantify the rates of establishment and densities of woody species on riparian sites undergoing restoration.	a	Riparian vegetation surveys/transects
		b	Plant growth and biomass measurements
9	Quantify the influences of native ungulates and beaver on shrub composition, structure, and recovery.	a	Plant growth and biomass measurements
10	Quantify the influences of different intensities of livestock grazing on parameters that may influence salmonid habitats-water quality, run-off,	a	Stream water chemistry monitoring

	infiltration, channel and riparian physical properties, nutrient cycling, and water quality.		
		b	Stream flow monitoring
		c	Litter fall
		d	Channel and soil measurements
		e	Plant transects

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	10/1997	09/1998	20
2	06/1998	08/1998	5
3	03/1998	08/1998	10
4	06/1998	09/1998	5
5	06/1998	09/1998	5
6	06/1998	09/1998	10
7	06/1998	09/1998	10
8	06/1998	09/1998	5
9	06/1998	09/1998	10
10	06/1998	09/1998	20

Schedule constraints.

Completion date.
2003

Section 5. Budget

FY98budget by line item

Item	Note	FY98
Personnel		
OSU Fish & Wildlife	Principle Investigator (PI), GRA	37,846
OSU Forest Engineering	PI	10,000
FS-PNW	PI, Technician	35,000
FS- LAG	Technicians	38,000
Fringe benefits	OSU Fish & Wildlife	5,078
Supplies, materials, non-expendable property	Fish and Wildlife	3,500
	Forest Engineering	1,000
	FS-PNW	2,000

	FS-LAG	500
Operations & maintenance		0
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	FS-PNW (1) smolt trap	15,000
PIT tags	# of tags:	0
Travel		
OSU Fish & Wildlife		5,000
OSU Forest Engineering		1,000
FS-PNW		6,000
FS-LAG		0
Indirect costs		
OSU Fish & Wildlife	Overhead 42.5%	21,855
OSU Forest Engineering	Overhead 42.5%	4,250
FS-PNW	Overhead 15.0%	5,250
FS-LAG	Overhead 15.0%	5,700
Subcontracts	Union County Watermaster (2) gaging stations for water year	12,000
Other	OSU Fish &Wildlife Graduate Tuition	10,566
TOTAL		219,545

Outyear costs

Outyear costs	**FY1999**	**FY2000**	**FY01**	**FY02**	**FY03**
Total budget	219,545	220,000	240,000	265,000	295,000
O&M as % of total	0	0	0	0	0

Section 6. Abstract

This project continues the life history work of summer steelhead smolt outmigrant trapping, juvenile rearing and habitat capability, and determination of winter habitat capability started in 1987. The life history information will be invaluable in determining restoration needs for summer steelhead in the Snake River Basin. A limiting factor analysis will developed for Snake River summer steelhead for determining restoration projects. Riparian vegetation work includes assessment of cattle and big game impacts on riparian species composition, biomass and recovery rates. This will be assessed on treated and untreated reaches using permanently marked species and quantified along permanent transects. Water chemistry and channel structure related to riparian vegetation will also be assessed using channel transects to determine width:depth ratios, pool frequency and depth and changes in wetted width. This will be invaluable in determining approaches to

restoration actions for riparian vegetation and aquatic habitat in the Snake River Basin for summer steelhead and spring/summer chinook salmon. This should be completed by 2003.

Section 7. Project description

a. Technical and/or scientific background.

Instream and riparian habitat improvement projects have been funded in the Columbia River Basin to the amount of over $200 million. Although this represents a large number of improvement efforts, the associated number of evaluations of this work has been suprisingly low. Continued funding of improvement projects without knowledge of the benefits to salmonid production raised the question of the past 20 years- "Are we producing Paper Fish?"

The need for understanding life history strategies of summer steelhead in the Grande Ronde Basin will provide the basis for identifying limiting factors which will aid in the selection of appropriate restoration techniques to improve tributary ecosystem recovery goals. Much is unknown about the early life history strategies of summer steelhead in tributary ecosystems. This project will provide necessary insight into the early life history of summer steelhead. Smolt production of the tributary ecosystem will be the focus of the monitoring.

In spite of the large expenditures of funds spent on restoration activities, we know little about the rate of patterns of riparian recovery. This is important in order for managers to prescribe the most ecological appropriate, as well as most cost-effective means of restoration. In order to ascertain the ecosystem response to restoration activities, we will quantify changes or development of important ecosystem features that have direct influences on salmonid populations following project implementation. This includes changes in riparian vegetation composition and structure, changes in soil and water properties and changes in stream channel characteristics. Restoration activities to be examined included the cessation of livestock grazing, construction of exclosures to both big game and cattle influences; placement of wood debris in channels and the re-opening of historic channels at sites that were previously channelized.

To maximize the effectiveness of a habitat program a coordinated approach is necessary where adequate funds are available for program and project planning, implementation, and long term evaluation of results. This long term evaluation fo both the physical and biological habitat elements both instream and riparian areas on Meadow Creek will be crucial in understanding recovery strategies and evaluation progress to achieving recovery goals for summer steelhead. This is currently one of the only long term projects of its kind in the interior Columbia River Basin.

b. Proposal objectives.

Obj 1,2, 3	Objective	Task a,b,c	Task
1	Quantify factors limiting the production of anadromous salmonids in Meadow Creek	a	Habitat survey and mapping
		b	Redd surveys
		c	Stream temperature monitoring
		d	Smolt sampling
		e	Stream flow monitoring
2	Based on limiting factor analysis, identify restoration techniques that will increase production of anadromous salmonids in Meadow Creek		
3	Quantify and analyze data on habitat characteristics, fish populations and assemblages, and salmonid smolt production to evaluate life history strategies of summer steelhead	a	Spring smolt trapping
		b	Summer habitat/fish sampling
		c	Habitat mapping
		d	Stream flow monitoring
4	Quantify channel response to passive and active restoration	a	Channel transects
		b	Stream flow monitoring
		c	Habitat surveys and mapping
5	Quantify the nutrient, physical, and biotic linkages between riparian and aquatic zones that influence the habitat quality of salmonids in Meadow Creek	a	Stream water chemistry monitoring
		b	Channel transects
		c	Habitat surveys and mapping
6	Determine the differences in the ecosystem processes that link floodplain and aquatic environment between intact and degraded riparian zones. This includes quantification in	a	Habitat survey and mapping

	forested reaches, meadow reaches and shrub reaches of Meadow Creek.		
		b	Stream temperature monitoring
		c	Stream flow monitoring
		d	Stream water chemistry monitoring
		e	Riparian vegetation surveys/transects
7	Quantify growth and reproductive response of riparian hardwoods to appropriate passive and active restoration approaches.	a	Riparian vegetation surveys/transects
		b	Plant growth and biomass measurements
8	Quantify the rates of establishment and densities of woody species on riparian sites undergoing restoration.	a	Riparian vegetation surveys/transects
		b	Plant growth and biomass measurements
9	Quantify the influences of native ungulates and beaver on shrub composition, structure, and recovery.	a	Plant growth and biomass measurements
10	Quantify the influences of different intensities of livestock grazing on parameters that may influence salmonid habitats-water quality, run-off, infiltration, channel and riparian physical properties, nutrient cycling, and water quality.	a	Stream water chemistry monitoring
		b	Stream flow monitoring
		c	Litter fall
		d	Channel and soil measurements
		e	Plant transects

c. Rationale and significance to Regional Programs.

Geomorphic, hydrologic and ecological connectivity in Columbia River watersheds: implications for endangered salmonids. The US Environmental Protection Agency and the Naitional science Foundation. This is a companion project located on the John Day and Upper Grande Ronde Basins. Indispensable contributions in labor, scientific expertise, laboratory analysis, stream surveys and personnel from this project to the Meadow Creek project will occur.

d. Project history

Meadow Creek, is a major tributary of the Upper Grande Ronde River. Meadow Creek and its riparian area have a long history of impacts dating back to early logging. Ungulate grazing in various degrees of intensity, has further impacted the riparian community. Salmonid populations in Meadow Creek are currently composed of anadromous summer steelhead and resident rainbow trout. Some spring/summer chinook smolts have also recently been found in Meadow Creek and tribal historical records indicate the stream once supported adult spring/summer chinook salmon.

Meadow Creek was identified in 1984 as one of the top ten priority streams in the Upper Grande Ronde subbasin in need of habitat improvement to be funded by Bonneville Power Administration (BPA) under the Northwest Power Council's Fish and Wildlife Program. The Meadow Creek project has also been selected for intensive, long-term evaluation of the physical, biological, and economic benefits of the direct habitat improvement work. By agreement, BPA funded the improvement work implemented by the la Grande Ranger District in 1990 and 1991 and USFS funded the evaluation efforts to be conducted by Pacific Northwest Research Station (PNW).

An extensive biological data base exists for Meadow Creek from aquatic research conducted since 1977. A habitat condition survey was completed by La Grande Ranger District in 1986. During 1987, Pacific Northwest Research (PNW) fisheries personnel began smolt sampling and development of a limiting factor analysis. Also in 1987, PNW personnel conducted a historical analysis of large, woody debris for comparison purposes with the current conditions. These surveys indicate a lack of quality pools, a poor width to depth ratio, streambank instablilty, poor overhead cover and a general deficiency of instream structural features favored by juvenile anadromous salmonids during summer and winter. The USDA FS, also in 1987, contracted with Washington State University to complete a hydrological analysis of the Meadow Creek subbasin, including design and location of needed habitat enhancement modifications covering eleven habitat improvement units (HIU) on four miles of stream. In 1988, a long-term research design for project evaluation was developed by PNW personnel and coordinated with the prescribed habitat enhancement modifications. Restoration modification covering approximately two lineal stream miles was completed in 1990.

Construction of a game-proof fence was completed in 1991. These fences along with the cattle fences maintained by the La Grande Ranger District provide the study area for the

riparian vegetation work to be continued by Dr. J. Boone Kauffman of Oregon State University.

e. Methods.

Smolt production will be assessed utilizing 2 rotary smolt traps, operated from iceout to ice up. Smolt and presmolts will be estimated by a mark recapture techniques and estimates made using a efficiency coefficient for each trap. Summer carrying capacity wil be assessed by use of the Hankin Reeves basinwide habitat inventory and subsampling habitat units for fish population and assembalges with an electrofishing unit. Population estimates will be made using a two pass removal technique. Adult escapement will be determined by redd counts in the spring through out the Meadow Creek System.

We will sample vegetation, soil, water and channel responses in both restored and paired untreated reaches. Intensive measurements on the changes in riparian ecosystem composition and structure following restoration will be made. Hardwood species have been permanently marked and will be measured annually to quantify parameters of growth, height, crown area, mainstem diameter, number of stems, biomass and reproductive effort. We have tagged 800 willows, cottonwoods and alder in areas under a variety of management scenarios: cattle grazed, ungrazed by cattle, ungrazed by all ungulates, areas where instream structures have been established, areas where historical channels have reopened. Changes in density and rates of establishment will be quantified in permanent transects to be measured annually.

In addition, we will also measure the ecological influences of vegetation recovery on salmonid habitats. These processes include year-long measurements of allocthonous inputs (litter), shade, changes in water chemistry (quality), and channel structure. These linkages are hypothesized to be a critical part of the restoration of endangered salmonid populations. In both treated and untreated areas, we will measure changes in litter inputs in willow, forest, and meadow reaches. We will also measure root biomass in the meadow reaches to ascertain the influence of recovery on channel structure. Changes in channel structure include pool frequency and depth, changes in quality/chemistry such as temperature, pH, conductivity, DOC, organic and inorganic N, and phosphate concentrations. All laboratory analyses will be conducted at Oregon State University research labs.

f. Facilities and equipment.

USDA Forest Service: Starkey Experimental Forest and Range Administrative Headquarters.
Pacific Northwest Research Station Habitat Laboratory.

Oregon State University: Department of Fish & Wildlife Habitat Ecology Lab.

g. References.

Kauffman, J.B., R.L. Beschta, N. Otting, and D.L. Cummings. 1995. Ecological approaches to riparian restoration in Northeastern Oregon. Restoration and Management Notes 13;12-15.

Kauffman, J.B., R.L. Beschta, N. Otting, and D. Lytjen. 1997. An ecosystem perspective of riparian and stream restoration in the Western United States. Fisheries 22(5):12-24

Case, R.L. and J.B. Kauffman. 1997 Wild ungulate influences on the recovery of willows, black cottonwood and thin-leaf alder following cessation of cattle grazing in Northeastern Oregon. Northwest Science 71:115-125.

Book Chapters

Kauffman, J.B., N. Otting, D. Lytjen, and R.L. Beschta. 1996. Ecological priciples and approaches to riparian restoration in the Western United States. IN:Healing the Watershed: A Guide to Watershed and Natural Fisheries Restoration. Workbook #2, Healing the Watershed Series, Pacific Rivers Council, Eugene, Oregon.

Lytjen, D., N. Otting, and J.B. Kauffman. 1997. Relationships of riparian vegetation and hydrology in mountain streams in the Western USA: impacts of water diversion. A white paper report written to the USFS National Stream Team, FT. Collins CO.

Graduate Thesis

Case, R.L. 1995. The ecology of riparian ecosystems of Northeast Oregon: Shrub recovery at Meadow Creek and the structure and biomass of headwater Upper Grande Ronde ecosystems. MS Thesis, Oregon State University, Corvallis. 137p

Boehne P.L. 1996. Outmigration of wild summer steelhead juveniles in Meadow Creek, Oregon an upriver tributary of the Columbia Basin. MS Thesis. Humbolt State University, Arcata, California.

Lytjen, D. 1998. Physical and biotic influences on composition and structure of woody riparian vegetation in Northeastern Oregon. MS Thesis (in progress).

Otting, N. 1998. Structure of montane floodplain plant communities in relation to groundwater and soil texture gradients in the Upper Grande Ronde Watershed, Oregon. MS Thesis (in progress).

Miller, A.C. 1997. Response of juvenile steelhead trout to an instream habitat rehabilitation project in Meadow Creek, Oregon. MS Thesis. Oregon State University, Corvallis, Oregon.

*Dwire, K. Connectivity of floodplain riparian areas and low-order streams of the Blue Mountains, Oregon. PhD. Dissertation (in progress), Oregon State University, Corvallis OR.

*Brookshire, J. The response of the riparian hardwood component to restoration and allocthonous inputs arising from forested and herbaceous riparian zones in Northeastern Oregon. MS Thesis (in progress), Oregon State University, Corvallis OR.

*Mahrt, M. Restoration and maintenance of riparian ecosystems in the Western USA: recovery of streamside vegetation and its effects on avian productivity an diversity. Ph.D. Dissertation (in progress), Oregon State University, Corvallis, OR.

*Funding for these three graduate research projects is dependent on this proposal.

Published Abstracts

Kauffman, J.B 1997. Natural disturbances and human perturbations that shape the biotic structure of riparian ecosystems. In: riparian and watershed management in the interior Northwest: an interdisciplinary perspective. A synposium held in La Grande, OR. September 11-12 1997.

Kauffman, J.B., R.L. Beschta, N. Otting, and D.Lytjen. 1997. An ecosystem perspective of riparian and stream restoration in the Western United States. Abstracts-1997 Annual meeting of the American Fisheries Society, Monterey CA, 1997.

Otting, N. 1997. Structure of montane floodplain plant communities in relation to groundwater gradients in the Upper Grande Ronde watershed, Oregon. Paper given at May 6, 1997 annual meeting of the PNW chapter of the Society of Wetland Scientists, La Sells Stewart conference Center, OSU, Corvallis, Oregon.

Case, R.L. J.B. Kauffman and D.L. Cummings. 1995. The resilience and recovery of willows, black cottonwood, and thin-leaf alder in Northeast Oregon. Page 213 In: W.D. Edge and S.L. Olsen-Edge (eds) Proceedings Sustaining Rangeland Ecosystems Symposium. Blue mountains Natural Resource Institute. La Grande, OR. pp:213.

Kauffman, J.B., J. Brookshire, K. Dwire, L. Ellingson and A. Thorpe. 1998. The influence of livestock on soil belwoground properties of montane riparian meadows communities in Northeastern Oregon. Abstracts of the 1998 ecological society of America meeting.

Everest, F.H., and P.L. Boehne. 1989. Habitat improvement for anadromous salmonids in Meadow Creek, Oregon, and evaluation of physical, biological, and economic benefits. Pacific Northwest Research Station, Corvallis, Oregon. 19pp.

Section 8. Relationships to other projects

Meadow Creek Summer Steelhead Life History reasearch/USDA Forest Service, PNW Research Station and Wallowa-Whitman National Forest. This project has been funded for 10 years by the USFS and the subject proposal will continue the life history investigation in a cooperative manner.

Geomorphic, hydrologic and ecological connectivity in Columbia River watersheds: implications for endangered salmonids. The US Environmental Protection Agency and the Naitional science Foundation. This is a companion project located on the John Day and Upper Grande Ronde Basins. Indispensable contributions in labor, scientific expertise, laboratory analysis, stream surveys and personnel from this project to the Meadow Creek project will occur.

Section 9. Key personnel

Dr. J. Boone Kauffman, Associate Professor Department of Fish & Wildlife, OSU 104 Nash Hall, Corvallis OR, 97331

Habitat, disturbance and ecosystem ecology of riparian ecosystems

Dr. Robert L. Beschta, Professor, Department of Forest Engineering, OSU Peavy Hall, Corvallis OR, 97331

Wildland hydrology, riparian and channel disturbance and aquatic ecosystem linkages.

Dr. James R. Sedell, Research Ecologist and Acting Program Manager, USDA Forest Service PNW Research Station 437 NW 31st , Corvallis OR, 97330

Aquatic ecosystem interactions, fish habitat relationships and disturbance ecology

Paul L. Boehne Fisheries and Watershed Staff, La Grande Ranger District 3502 Hwy 30, La Grande OR, 97850

Fish habitat relationships, inchannel and riparian restoration and aquatic ecosystems interactions

Resumes and curriculum vitae will be supplied for key personnel at a later date.

Section 10. Information/technology transfer

Technology transfer will take many forms including but not limited to graduate theses, journal articles, general technical reports, symposium proceedings and project reports to BPA and NWPPC and USDA Forest Service for adding to LRMP revisions and NMFS for Recovery Plan assessments.